REMARKS

Claims 1-10 are pending in this application. Claims 1 and 4 have been amended to more particularly point out and distinctly claim the Applicants' invention. New claims 7-10 have been added. No new matter has been added. For the reasons set forth below, Applicants respectfully submit that all pending claims are in condition for allowance.

Rejection Under 35 U.S.C. §112, First Paragraph

Claim 4 stands rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. The Examiner opines that while the specification teaches a fuel reforming apparatus wherein the activity of the reforming catalyst is recovered when a concentration of hydrogen gas in the reformed gas becomes *not less* than a predetermined concentration, it does not teach recovering the reforming catalyst when a concentration of hydrogen gas in the reformed gas becomes *higher* than a predetermined concentration. Applicants have amended claim 4 to recite recovering the reforming catalyst when a concentration of hydrogen gas is below a predetermined concentration. It is believed that by this amendment, the rejection is overcome.

Accordingly, Applicant respectfully requests removal of this ground for rejection.

Rejection of Claims 1, 2 and 4 under 35 U.S.C. §103(a)

Claims 1, 2 and 4 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Cheng (U.S. Patent No. 4,855,267) in view of Sinfelt et al. (U.S. Patent No. 3,839,194) or Adsetts (U.S. Patent No. 3,926,584) or Apelian et al. (U.S. Patent No. 5,393,717).

Cheng is directed to a process for regeneration of copper containing catalysts used in methanol or methyl formate dissociation. The Examiner asserts that that Cheng discloses "a

control unit for controlling the supply of raw material to [the] reforming catalyst on the basis of a predetermined condition and for controlling the supply of an inert gas or water to [the] reforming catalyst." The Examiner makes broad references to col. 1, line 64 to col. 2, line 18 and to col. 2, lines 45-50 of Cheng for support of this teaching. The portions of Cheng relied upon by the Examiner are set forth below:

> Preferably, the oxidation is conducted at a temperature of 275° C. to 400° C. and 50 kPa to 400 kPa. Air provides a convenient source of oxygen. Oxygen, or the combination of oxygen and inert gases such as nitrogen and argon, may also be used with at least 1 vol% oxygen, preferably 15-30% oxygen. Treatment time is at least 15 minutes, but may be as long as 24 h to 48 h. Preferably, the oxidation is conducted over 2-18 h.
>
> Preferably, the reduction is conducted at a temperature of 200° C. to 300° C. and 100 kPa to 300 kPa. The preferred reducing gases are hydrogen, carbon monoxide, or mixtures thereof. Mixtures of reducing gases with inert gases such as nitrogen or argon may be used with at least 0.2 vol%, preferably 2 to 10 vol%, of the reducing gas. The reduction time is at least 15 min and preferably 2 to 3 h.
>
> Typically, the catalysts are regenerated in-situ by passing the oxidizing or reducing gases over the catalysts in the reactor. Deactivated catalysts may also be removed from the reactor and regenerated in an oven or a furnace. Gas flowrates during regeneration are not critical, and regeneration may even be conducted in a static atmosphere.
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> * * *
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> To evaluate the efficiency of regeneration, a series of reactions was conducted until significant deactivation (as judged by conversion) was observed. Then the feed was stopped, the reactors purged with nitrogen for few minutes, the catalysts regenerated, and the reactions resumed.

The Cheng reference discloses the supply of <u>oxidation and reducing materials</u> to regenerate the deactivated copper containing catalyst <u>due to deposition of carbonaceous materials (coking, coke) on the surface of the catalyst</u>.

The present invention includes a control unit. The function of the control unit is to control the supply of hydrocarbon to the reforming catalyst in a reforming unit and the supply of the inert gas or water vapor. The hydrocarbon includes sulfur compounds which poisons the reforming catalyst. The adsorption of the sulfur compounds on the catalyst leads to the catalyst becoming inactive. During the reforming reaction, the catalyst is heated. When the catalyst reaches a predetermined temperature, the control unit stops the flow of hydrocarbon and allows an inert gas or water vapor to be supplied to the catalyst in the reforming unit to recover the activity of the of the catalyst. The activity of the catalyst is recovered by heating the catalyst in an inert gas or water vapor (steam).

Cheng does not disclose or suggest this concept. The reference does not disclose or suggest a control unit that controls the supply of an inert gas or water vapor to regenerate deactivated reforming catalyst due to the adsorption of sulfur compounds. This feature of the invention is also not disclosed or suggested in any of Sinfelt et al., Adsetts and Apelian et al.. So, even a skilled one cannot achieve the present invention on the basis of these references.

Furthermore, The Examiner acknowledges Cheng does not disclose or suggest that when the catalyst reaches a predetermined temperature, a control unit stops the flow of hydrocarbon to the reformation chamber and allows an inert gas or water vapor into the chamber to initiate the catalyst recovery operation. For this deficiency, the Examiner relies on Sinfelt et al., Adsetts and Apelian et al. However, none of these secondary references make up for the deficiency of Cheng since none of the secondary references disclose or suggest a control unit for controlling the flow of hydrocarbon and inert gas or water vapor into the reformation reactor when the temperature of

the catalyst reaches a predetermined temperature. Cheng is not concerned with the temperature of the catalyst for his process.

The Examiner made a finding that "[i]t was well known in the art at the time of the invention that, for endothermic reactions, there exists a temperature window at which the reaction occurs" and that "[said] reaction is started at lower end of said temperature window and as time on line elapses (an [sic, as the] catalyst begins to deactivate) the operation temperature is increased towards the upper end of said temperature window to maintain desired catalyst activity." There is no evidence of record to support this finding by the Examiner. Reliance on common knowledge does not fulfill the Examiner's obligation to cite reference(s) in support of his or her conclusion. *In re Lee*, 277 F.3d 1338, 61 USPQ2d 1430 (Fed. Cir. 2002). See also *In re Thrift*, 298 F.3d 1357, 63 USPQ2d 2002, (Fed. Cir. 2002). The Examiner makes the statement: "With maximum operating temperature being determined for each specific reaction by determining when rapid catalyst deactivation starts to occur." This statement is incomplete and not understood even in light of the citations by the Examiner to the secondary references.

The Examiner concludes that in view of what he considers is well known in the art, "it would have been obvious to one having ordinary skill in the art at the time of the invention was made to monitor the temperature of the catalyst of Cheng to determine when the optimum starting point is for the catalyst regeneration, as this is known and tied method of ensuring balance between operation and catalyst regeneration cycles" and that "[d]oing so would involve use of a known process for its intended use in a known environment to accomplish entirely expected result." This conclusion is not supported by any evidence by the Examiner. There is no teaching or suggestion in Cheng and any of the secondary references taken alone or in

combination of monitoring the temperature of the catalyst to determine an optimum starting point for catalyst generation. Moreover, the teachings of the prior art does not establish that the temperature of the catalyst is a result effective variable with respect to recovering the activity of a reforming catalyst. See *In re Boesch*, 617 F.2d 272, 276, 205 USPQ 215, 219 (CCPA 1980). The Examiner has not presented an cogent scientific reasoning from the teaching of any of the prior references relied upon of how the conclusion is based and how the teachings of the prior art would have led a person having ordinary skill in the art as to what is well known in the art.

For all of the foregoing reasons, the Examiner has not presented a *prima facie* case of obviousness. Accordingly, it is respectfully requested that the rejection of claims 1, 2 and 4 over Cheng in view of Sinfelt et al. or Adsetts or Apelian et al. be reconsidered and withdrawn.

Rejection of Claim 5 under 35 U.S.C. §103(a)

Claim 5 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Cheng (U.S. Patent No. 4,855,267) in view of Sinfelt et al. (U.S. Patent No. 3,839,194) or Adsetts (U.S. Patent No. 3,926,584) or Apelian et al. (U.S. Patent No. 5,393,717), further in view of Okada et al. (U.S. Patent No. 5,302,470. Claim 5 is a dependent claim and is dependent on claim 1. For reasons stated *supra*, which are incorporated herein by reference, the combined teachings of Cheng, Sinfelt et al., Adsetts and Apelian et al. do not teach or suggest the invention as set forth in claim 1. The Okada et al. reference does not make up for the deficiencies of Cheng, Sinfelt et al., Adsetts and Apelian et al. as set forth *supra*. For all of the foregoing reasons, the Examiner has not presented a *prima facie* case of obviousness. Accordingly, it is respectfully requested that the rejection of claim 5 over the combined teachings of Cheng, Sinfelt et al., Adsetts, Apelian et al. and Okada et al. be reconsidered and withdrawn.

Rejection of Claim 6 under 35 U.S.C. §103(a)

Claim 6 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Cheng (U.S. Patent No. 4,855,267) in view of Sinfelt et al. (U.S. Patent No. 3,839,194) or Adsetts (U.S. Patent No. 3,926,584) or Apelian et al. (U.S. Patent No. 5,393,717) further in view of Villemin (U.S. Patent No. 4,089,941). Claim 6 is a dependent claim and is dependent on claim 1. For reasons stated *supra*, which are incorporated herein by reference, the combined teachings of Cheng, Sinfelt et al., Adsetts and Apelian et al. do not teach or suggest the invention as set forth in claim 1. The Villemin reference does not make up for the deficiencies of Cheng, Sinfelt et al., Adsetts and Apelian et al. as set forth *supra*. For all of the foregoing reasons, the Examiner has not presented a *prima facie* case of obviousness. Accordingly, it is respectfully requested that the rejection of claim 6 over the combined teachings of Cheng, Sinfelt et al., Adsetts, Apelian et al. and Villemin be reconsidered and withdrawn.

New Claims

New claims 7-10 have been added to define the method of recovering the activity of the reforming catalyst due to sulfur contamination in steam-reforming a hydrocarbon fuel. The method comprises (i) contacting the catalyst with the hydrocarbon fuel until the temperature of the catalyst reaches a predetermined temperature, (ii) terminating the flow of the hydrocarbon fuel, (iii) heating the catalyst to maintain the temperature of the catalyst at least at the predetermined temperature, and (iv) contacting the catalyst with water vapor or an inert gas to recover the activity of the reforming catalyst. This method is not taught or suggested by any of the references. While Cheng discloses comparative experiments for treating a deactivated

catalyst with nitrogen and water, the reference discloses that his treatment alone does not restore the activity of the catalyst (col. 3, lines 16-19 and 52-56).

CONCLUSION

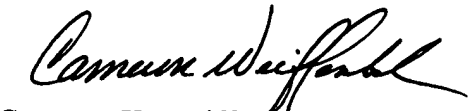
For the foregoing reasons, it is submitted that the claims 1-10 are patentable over the teachings of the prior art relied upon by the Examiner. Accordingly, favorable reconsideration of the claims is requested in light of the preceding amendments and remarks. Allowance of the claims is courteously solicited.

If there are any outstanding issues that might be resolved by an interview or an Examiner's amendment, the Examiner is requested to call Applicants' attorney at the telephone number shown below.

To the extent necessary, a petition for an extension of time under 37 CFR § 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

McDERMOTT, WILL & EMERY



Cameron K. Weiffenbach
Registration No. 44,488

600 13th Street, N.W.
Washington, DC 20005-3096
(202) 756-8000 CKW:ckw
Facsimile: (202) 756-8087
Date: April 16, 2004